

HISTORIC PROPERTY INVENTORY FORM

IDENTIFICATION SECTION

Field Site No. 222-T OAHF No. _____ Date Recorded 1 July 1997
 Site Name Historic 222-T Sample Preparation Laboratory
 Common Control Laboratory; Analytical Laboratory; Office Building
 Field Recorder Holly K. Chamberlain
 Owner's Name U.S. Department of Energy, Richland Operations Office
 Address P.O. Box 550
 City/State/Zip Code Richland, WA 99352

Status

- ☒ Survey/Inventory
☐ National Register
☐ State Register
☐ Determined Eligible
☐ Determined Not Eligible
☐ Other (HABS, HAER, NHL)
☐ Local Designation

Photography

Photography Neg. No. (See continuation sheet)
 (Roll No. & Frame No.)
 View of (See continuation sheet)
 Date (See continuation sheet)

Photo at right, HCRL Roll No. 384, Frame 6A.
 View of north elevation.

Classification

District ☐ District ☐ Site ☐ Building ☒ Structure ☐ Object
 District Status ☒ NR ☐ SR ☐ LR ☐ INV
 Contributing ☒ Non-Contributing
 District/Thematic Nomination Name Hanford Site Manhattan Project and Cold War Era Historic District

Description Section

Materials & Features/Structural Types

Building Type Industrial
 Plan Rectangular
 Structural System Reinforced Concrete
 No. of Stories One

Roof Type

☐ Gable ☐ Hip
☒ Flat ☐ Pyramidal
☐ Monitor ☐ Other (specify) _____
☐ Gambrel
☐ Shed

Cladding (Exterior Wall Surfaces)

☐ Log
☐ Horizontal Wood Siding
 Rustic/Drop ☐
 Clapboard ☐
☐ Wood Shingle
☐ Board and Batten
☐ Vertical Board
☐ Asbestos/Asphalt
☐ Brick
☐ Stone
☐ Stucco
☐ Terra Cotta
☒ Concrete/Concrete Block
☐ Vinyl/Aluminum Siding
☐ Metal (specify) _____
☐ Other (specify) _____

Roof Material

☐ Wood Shingle
☐ Wood Shake
☐ Composition
☐ Slate
☒ Tar/Built-up
☐ Tile
☐ Metal (specify) _____
☐ Other (specify) _____
☐ Not visible

Foundation

☐ Log ☐ Concrete
☐ Post & Pier ☐ Block
☐ Stone ☒ Poured
☐ Brick ☐ Other (specify) _____
☐ Not visible

Integrity

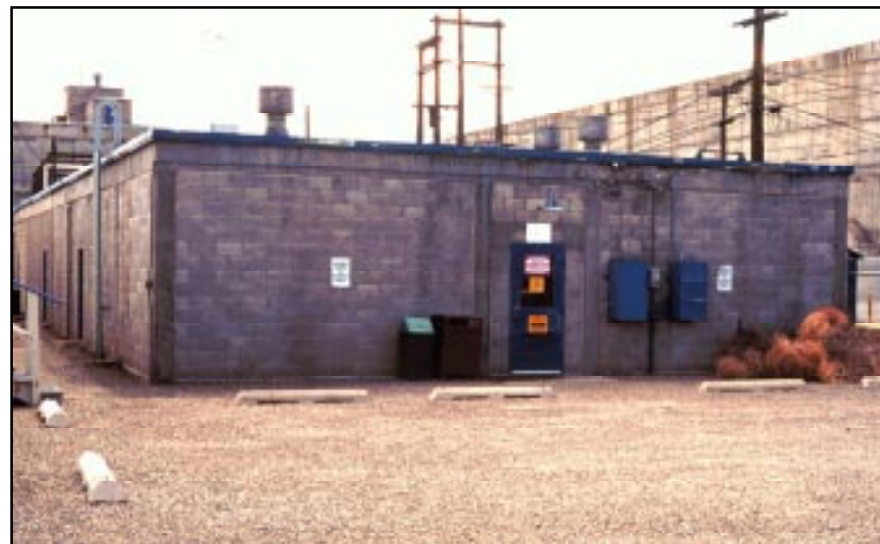
(Include detailed description in
 Description of Physical Appearance)

	Intact	Slight	Moderate	Extensive
Changes to plan	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Changes to windows	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Changes to original cladding	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Changes to interior	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Other (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

State of Washington, Department of Community Development
 Office of Archaeology and Historic Preservation
 111 21st Avenue Southwest, Post Office Box 48343
 Olympia, Washington 98504-8343 (206)753-4011

LOCATION SECTION

Address 222-T Building, 200 West Area
 City/Town/County/Zip Code Richland/Benton County/99352
 Twp. 12 N Range 26 E Section 6 1/4 Section NW 1/4 1/4 Sec _____
 Tax No./Parcel No. _____ Acreage _____
 Quadrangle or map name Gable Butte, Wash., 7.5 minute series
 UTM References Zone 11 Easting _____ Northing _____
 Plat/Block/Lot _____
 Supplemental Map(s) _____



High Styles/Forms (Check one or more of the following)

<input type="checkbox"/> Greek Revival	<input type="checkbox"/> Spanish Colonial Revival/Mediterranean
<input type="checkbox"/> Gothic Revival	<input type="checkbox"/> Tudor Revival
<input type="checkbox"/> Italianate	<input type="checkbox"/> Craftsman/Arts & Crafts
<input type="checkbox"/> Second Empire	<input type="checkbox"/> Bungalow
<input type="checkbox"/> Romanesque Revival	<input type="checkbox"/> Prairie Style
<input type="checkbox"/> Stick Style	<input type="checkbox"/> Art Deco/Art Moderne
<input type="checkbox"/> Queen Anne	<input type="checkbox"/> Rustic Style
<input type="checkbox"/> Shingle Style	<input type="checkbox"/> International Style
<input type="checkbox"/> Colonial Revival	<input type="checkbox"/> Northwest Style
<input type="checkbox"/> Beaux Arts/Neoclassical	<input type="checkbox"/> Commercial Vernacular
<input type="checkbox"/> Chicago/Commercial Style	<input type="checkbox"/> Residential Vernacular (see below)
<input type="checkbox"/> American Foursquare	<input checked="" type="checkbox"/> Other (specify)
<input type="checkbox"/> Mission Revival	<input type="checkbox"/> Industrial Vernacular

Vernacular House Types

☐ Gable Front
☐ Gable Front and Wing
☐ Side Gable
☐ Cross Gable
☐ Pyramidal/Hipped
☐ Other (specify) _____

NARRATIVE SECTION

Study Unit Themes (check one or more of the following)

☐ Agriculture
☐ Architecture/Landscape Architecture
☐ Arts
☐ Commerce
☐ Communications
☐ Community Planning/Development

☐ Conservation
☐ Education
☐ Entertainment/Recreation
☐ Ethnic Heritage (specify) _____
☐ Health/Medicine
☐ Manufacturing/Industry
☐ Military

☐ Politics/Government/Law
☐ Religion
☐ Science & Engineering
☐ Social Movements/Organizations
☐ Transportation

☒ Other (specify) Manhattan Project and Cold War Era

☒ **Study Unit Sub-Theme(s)** Chemical Separation,
Operations Support, Waste Management,
Administrative Support, and Social History

Statement of Significance

Date of Construction 1944 Architect/Engineer/Builder E.I. du Pont de Nemours & Co.

☒ In the opinion of the surveyor, this property appears to meet the criteria of the National Register of Historic Places.

☒ In the opinion of the surveyor, this property is located in a potential historic district (National and/or local).

The 222-T Sample Preparation Laboratory was the first of three identical laboratories at Hanford Engineer Works to be finished, and was the most significant, by virtue of its association with T Plant. T Plant, or the 221-T Cell Building, was the world's first large-scale chemical processing facility, and was the site of the processing of the nuclear material made into the world's first and third atomic explosions. Because all work in the radioactively "hot" T Plant had to be conducted remotely, the 222-T Building provided a very necessary laboratory setting in which samples drawn from the chemical separations process could be radiochemically analyzed to make sure that the process was working correctly.

(See continuation sheet)

Description of Physical Appearance

Located slightly to the southeast of T Plant in the 200 West Area, 222-T is a one-story, rectangular building made with reinforced concrete frame construction. The interior and exterior walls are made of smooth-faced concrete block. Extra concrete reinforcing exists for what was originally the sample measuring and instrument repair rooms to render them resistant to explosions. The Sample Preparation Laboratory has seven outside pedestrian entrances, all with metal doors, one of which was an emergency exit from the sample measuring room. The two entrances on the west side have outside vestibules. Louvered vents are set into the exterior walls on the west side. The four-inch thick concrete roof is topped with insulation board and gravel roofing.

(See continuation sheet)

Major Bibliographic References

du Pont de Nemours and Company, E.I. 1945. *Construction, Hanford Engineer Works, U.S. Contract No. W-7412-ENG-1, du Pont Project 9536, History of the Project, Volume III*. HAN-10970. Wilmington, Delaware.

General Electric Company. 1956. *Counting Methods and Calculations Used by the Analytical Laboratories - Separations Section*. HW-42111. Richland, Washington.

General Electric Company. 7 July 1944. *Hanford Engineer Works Monthly Report June 1944*. HW-7-273-Del. Richland, Washington.

General Electric Company. 8 August 1944. *Hanford Engineer Works Monthly Report July 1944*. HW-7-384. Richland, Washington.

HISTORIC PROPERTY INVENTORY FORM

222-T Sample Preparation Laboratory (Control Laboratory) (Analytical Laboratory) (Office Building)
Continuation Sheet

Photography, continued

HCRL Roll No. 384, Frame No. 4

View of: North Elevation

Date: 31 July 1997

HCRL Roll No. 384, Frame No. 6A

View of: North Elevation

Date: 31 July 1997

Photography Neg. No. (Roll No. and Frame No.) 32993-38

View of: Aerial from west; 222-T is located just below the stack.

Date: Undated

Photography Neg. No. (Roll No. and Frame No.) P7848

View of: Aerial from south; 222-T is approximately in the center of the photograph

Date: Undated

HISTORIC PROPERTY INVENTORY FORM

222-T Sample Preparation Laboratory (Control Laboratory) (Analytical Laboratory) (Office Building)

Continuation Sheet

Statement of Significance, continued

Construction work under the aegis of du Pont's S Department commenced in the 200 West Chemical Separations Area in June 1943. Although work on all the separations facilities continued essentially concurrently until the summer of 1944, labor shortages then due to wartime conditions forced construction administration staff to focus attention on finishing one complex and rendering it operational. B Reactor, the world's first large-scale plutonium production reactor, was almost complete by that time, and would soon be operational. T Plant facilities could not be allowed to lag far behind in the "processing," or separating components out of the aluminum-jacketed uranium fuel elements which would be irradiated within B Reactor. By midsummer, 222-T was mostly done, with much of the laboratory equipment already installed, but building designers determined that more change rooms and showers would be needed. As was often the case with structures at the Hanford site, design changes were deemed necessary as new information about a building's functions or staffing realities became available after construction was already underway. Additional change rooms were incorporated into the design, adding about 56 feet to the original plans and necessitating the relocation of some already-installed equipment. The completion of 222-T was also delayed by late delivery of some of the laboratory equipment and furniture. However, it was declared operational in September, 1944.

All operations buildings associated with T Plant were staffed with personnel working regular shifts by the end of October, 1944. 222-T was first used as a training center for instrument mechanics being taught to perform the highly technical, and, at the time, unique electronic work necessary for plant production. By early in the new year, however, the staff of the Sample Preparation Laboratory was engaged in radioassay (measurement of the radioactive components) of samples from the bismuth phosphate chemical separations process in T Plant, initiated in December 1944 by the arrival of the first irradiated fuel rods from B Reactor. 222-T staff also worked toward creating, testing, and improving tools for remote handling of hazardous materials. After full operation was achieved, and the chemical processing facilities were separating plutonium, uranium, and fission product isotopes from irradiated fuel elements, tests were done in 222-T on samples from the bismuth phosphate precipitation process used to do the separations. Samples were analyzed to produce information on plutonium, byproducts, and ions. The plutonium concentration was measured

HISTORIC PROPERTY INVENTORY FORM

222-T Sample Preparation Laboratory (Control Laboratory) (Analytical Laboratory) (Office Building)

Continuation Sheet

Statement of Significance, continued

by the disintegration rate of alpha (positively charged) particles, while the plutonium decontamination (separation from the unwanted fission products) was indicated by the rates of beta and gamma particle decay. Tests were also conducted on samples from the 224-T Bulk Reduction Building, where plutonium solutions were concentrated, and from the "head-end" semi-works in T Plant, where a small-scale, but full strength, bismuth phosphate process improvement laboratory operated from late 1944 into early 1947.

The bismuth phosphate process samples came from small, lead-shielded sampling pits located about 2 feet underneath the canyon cells in the 221-T Building and representing different stages in the dissolution and precipitation process. Samples were obtained by inserting a long, thin "trombone" apparatus into a riser pipe coming from the sampling pits. The sample was then transferred into a stainless steel "doorstop" carrier, or, in the case of samples predicted to be less active, into a "bayonet" calibrated pipette carrier. The samples were carried into the laboratory part of the building through the southernmost door on the west side. The samples were stored in the 222-T Building on shelves behind 1 inch thick lead shielding in the sample preparation room. Solutions were prepared for testing using calibrated flasks and pipettes to ensure that the results would be as uniform as possible. The tests to measure the rates of radioactive disintegration were carried out in laboratory hoods in the heavily-shielded sample measurement room, also known as the sample measuring or counting room.

Considerable effort went into developing methodical, standardized counting and measurement techniques which would not only be meaningful within the realm of ongoing needs and applications at the Hanford site but would also be uniform with the analytical procedures carried out over the years at other sites, such as Oak Ridge and Savannah River. The invention of new equipment was required in some cases to perform the exacting tasks of analyzing process solutions, and also new units of measurement. Equipment and measurement standards varied over time, but attempts were made to calibrate similar equipment the same way across the country, to employ the same counting techniques, and to apply the same analytical standards to the counts. The type of information required was the deciding factor in how the analysis was done and the count calculated. For instance, different equations were used if plutonium activity was calculated, waste solutions measured, or if the characteristics of "dissolver

HISTORIC PROPERTY INVENTORY FORM

222-T Sample Preparation Laboratory (Control Laboratory) (Analytical Laboratory) (Office Building) Continuation Sheet

Statement of Significance, continued

solutions” from the separations process were being determined. All information collected was stored on an analysis card, along with how the results were achieved. Research was done to keep track of which measuring methods produced the most uniform results.

The equipment used by 1956 to count alpha particles at the Hanford site were methane flow, proportional counters (ASP counters). The samples of solution were mounted on discs which held them through the counting process. One type of measurement calculated was that of gross alpha activity, which measured the total number of alpha particles whatever their nuclide source. Other measurements required the separation of specific nuclides for individualized testing.

Beta counting was carried out by passing samples through a mica end-window Geiger-Muller counter. This device operated by means of passing a pulse of electricity through the sample while it was in a gas-filled tube. Beta analysis was abandoned by 1956, except for usage with waste monitoring programs which were not carried out in 222-T.

A liquid gamma counter was the first equipment used to count gamma photons. Soon thereafter, a Geiger-Muller end window counter which employed a lead-aluminum absorber was used. This method was not very efficient for counting gamma particles, however, and required that very “hot” samples be used, which was dangerous for laboratory personnel. The Shonka, a high-pressure ionization chamber developed in connection with studies for Reduction Oxidation Process operations, was used next. This offered a much greater level of efficiency in terms of counting gamma photons but presented the results of the count in terms which were difficult to compare with those obtained by the previous method and therefore required more complicated analytical techniques.

HISTORIC PROPERTY INVENTORY FORM

222-T Sample Preparation Laboratory (Control Laboratory) (Analytical Laboratory) (Office Building)

Continuation Sheet

Statement of Significance, continued

By 1953, gamma counting was accomplished with a gamma scintillation counter (GSC), developed in conjunction with the start-up of operation Reduction Oxidation Process Plant but used in 222-T. Gamma photons interacting with a sodium iodide, thallium-activated crystal in this mechanism caused light pulses in the crystal. These scintillations were converted to electronic pulses and amplified by means of a photomultiplier tube connected to the crystal. The pulses then passed through the counter, where they were further amplified and counted. This equipment represented a significant improvement over the earlier Geiger-Muller end window counter, which was less efficient at counting, could not count as many types of samples, and resulted in a comparatively high radiation exposure for laboratory workers. It was also an improvement over the Shonka.

As with all Hanford site facilities, safety was of great concern in the 222-T Building. Measures to control radioactive contamination here were those typical for buildings where radioactive materials were being handled, including having staff members remove their own clothing in the change rooms, store it in the lockers provided, and don white laboratory clothing for work time, including shoe covers. Gloves were worn during many processes. A full-time inspector working in both 222-T and the other Sample Preparation Laboratory in 200 W, 222-B, examined the premises to make sure that radioactive contamination was avoided or arrested.

The start-ups of the more efficient Reduction Oxidation Processing Plant in January, 1952, and the Plutonium-Uranium Extraction Plant in 1956, gradually left T Plant no longer needed for its original use, and its Sample Preparation Laboratory surplus for processing uses as well. By 1964, the northern part of the 222-T Building was in use for offices while the southern, or original laboratory portion, had not been decontaminated and was not in use, although much of the analytical equipment remained in place at that time. By approximately 1970, the building was no longer in office use but was used for storing laundry. The 222-T Building was vacated in October 1994.

HISTORIC PROPERTY INVENTORY FORM

222-T Sample Preparation Laboratory (Control Laboratory) (Analytical Laboratory) (Office Building) Continuation Sheet

Statement of Significance, continued

The 222-T Building housed an integral part of the research and operations support necessary to make the separations process for the world's first large-scale chemical processing facility successful, and produce nuclear material used in the world's first and third atomic explosions. The 222-T Building is significant under Criterion A, due to its important association with the Manhattan Project and Cold War Era. Therefore, it is the conclusion of the U.S. Department of Energy that 222-T is eligible for inclusion in the National Register of Historic Places as a contributing property within the Hanford Site Manhattan Project and Cold War Era Historic District.



Aerial View From the South, undated (#P7848-0)



Aerial View From the West, undated (#32993-38)

**HISTORIC PROPERTY INVENTORY FORM
222-T Sample Preparation Laboratory (Control Laboratory)
(Analytical Laboratory) (Office Building)
Continuation Sheet**

Description of Physical Appearance, continued

The 222-T Building currently has about 39 rooms, of which most served as office spaces while the building was still open, but some of which served as storage spaces. The subdivisions of the original sample measuring room and sample preparation laboratory into multiple office spaces took place after 1964. The building originally had 22 rooms, including the technically-oriented chemical and sample preparation laboratories, and sample measurement, instrument repair, balance, equipment, machinery, and receiving rooms. Non-technical spaces at the northern part of the building, and generally oriented along an L-shaped corridor, included the

conference room, offices, storeroom, restrooms, locker rooms, lounge, and janitor's closet. Flooring materials included linoleum and asphalt tile. Some interior walls were sheathed with plaster. The equipment room housed apparatus for air conditioning, ventilation, water distillation, water heating, and steam vacuum jet. The machinery room housed an additional hot water heater and ventilation system. Another ventilation system existed to remove fumes from the hoods in the laboratory rooms.

Alterations included the late 1950 addition of more shielding and ventilation equipment which was designed to reduced the amount of radioactivity around the waste sample disposal and equipment decontamination facilities. New acid dispensing equipment and piping were added in 1951. The east elevation originally had only one door. It provided entry into the equipment room. The east elevation presently has three more doors which allowed access into the northern portion of the building.

The overall square footage of the building is 7,336, while its dimensions are 64 feet by 160 feet 6 inches x 15 feet 2 inches.

HISTORIC PROPERTY INVENTORY FORM

222-T Sample Preparation Laboratory (Control Laboratory) (Analytical Laboratory) (Office Building)

Continuation Sheet

Major Bibliographic References, continued

General Electric Company. 9 September 1944. *Hanford Engineer Works Monthly Report August 1944*. HW-7-612. Richland, Washington.

General Electric Company. 10 October 1944. *Hanford Engineer Works Monthly Report September 1944*. HW-7-750-Del. Richland, Washington.

General Electric Company. 10 November 1944. *Hanford Engineer Works Monthly Report October 1944*. HW-7-870-Del. Richland, Washington.

General Electric Company. 10 January 1945. *Hanford Engineer Works Monthly Report December 1944*. HW-7-1011 -Del. Richland, Washington.

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General Electric Company. 1944. *Hanford Technical Manual Section C*. HW-10475 C. Richland, Washington.

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General Electric Company. 1945. *222-U Standard Practice Manual*. HW-3-2846. Richland, Washington.

Gerber, M.S., Ph.D. 1994. *A Brief History of the T Plant Facility at the Hanford Site*. WHC-MR-0452, Addendum 1. Westinghouse Hanford Company, Richland, Washington.

Gerber, M.S., Ph.D. 1992. *Legend and Legacy: Fifty Years of Defense Production at the Hanford Site*. WHC-MR-0293. Westinghouse Hanford Company, Richland, Washington.

Gerber, M.S., Ph.D. 1993. *Manhattan Project Buildings and Facilities at the Hanford Site: A Construction History*. WHC-MR-0425. Westinghouse Hanford Company, Richland, Washington.

Mattair, Steve. 1996. *222-T Building Shutdown Plan*. DynCorp Tri-Cities Services, Inc. Richland, Washington.

HISTORIC PROPERTY INVENTORY FORM

222-T Sample Preparation Laboratory (Control Laboratory) (Analytical Laboratory) (Office Building)

Continuation Sheet

Major Bibliographic References, continued

Rulon, Lyle, retired supervisor for Analytical Laboratories in 222-T and 222-B. 26 June 1997. Telephone Interview. Richland, Washington.



FACILITIES MANAGEMENT
SCALE 1/16"=1'-0" 10/24/86

200 WEST AREA

Building 222-T Floor Plan, 1986



FLOOR PLAN

13